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The Prospects of Nanorods as Blending Agents in Immiscible Binary Polymer Blends MICHAEL J. A. HORE, MOHAMED LARADJI, Dept. of Physics, The University of Memphis — Systematic, large scale dissipative particle dynamics computer simulations performed in three dimensions indicate that the dynamics of phase separation of polymer blends containing rigid nanorods can be substantially slower than that of a pure binary blend, and that the dynamics depend greatly on the aspect ratio, i.e length/diameter, of the nanoparticles. When compared with spherical nanoparticles, it is also found that nanorods with the same volume fraction, or same surface area, are more effective in slowing down the dynamics of the blend – an indication that the anisotropy of the nanoparticles plays an important role in the phase separation kinetics. For a given volume fraction of rods, the domain growth exponent decreases (and growth may become non-algebraic) as the aspect ratio of the rods is increased. Growth is also slowed as the volume fraction of the nanorods is increased for a given aspect ratio. Additionally, it is found that the effect of lengthwise polydisperse rods is similar to that of monodisperse rods with a length equal to the mean length of the polydisperse rods. In cases with high aspect ratio rods or high volume fractions of rods, systems often proceed to micro-phase separated states – results not seen for nanospheres. The upshot of these results is that nanorods may potentially be used as effective emulsifiers of immiscible binary polymer blends. The thermodynamic stability of these micro-phase separated states will be discussed.

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